

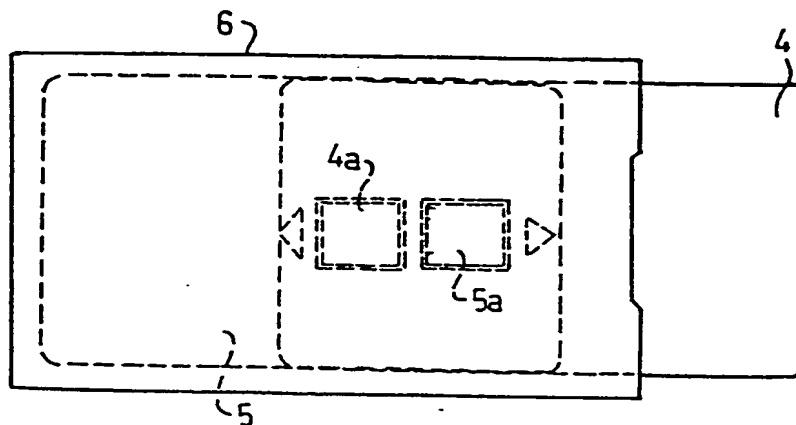
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(21) International Application Number: PCT/FI91/00052 (22) International Filing Date: 19 February 1991 (19.02.91) (30) Priority data: 900865 21 February 1990 (21.02.90) FI (71)(72) Applicant and Inventor: VILLIKARI, Matti [FI/FI]; Kattilalaaksontie 12, SF-02320 Espoo (FI). (74) Agent: OY KOLSTER AB; Stora Robertsgatan 23, P.O. Box 148, SF-00121 Helsinki (FI). (81) Designated States: AT (European patent), AU, BE (Euro- pean patent), CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (Eu- ropean patent), IT (European patent), JP, LU (European patent), NL (European patent), NO, SE (European pa- tent), US.		Published With international search report. In English translation (filed in Finnish).

(54) Title: METHOD FOR HANDLING CASH OR OTHER CONFIDENTIAL INFORMATION ELECTRONICALLY



(57) Abstract

The present invention relates to a method and a system for handling cash or other confidential information electronically, where the information is transferred electronically through a smartcard (4) or a similar device with programmable memory. In order to provide a new and secure handling method based on smartcards, the transfer of funds or data to or from the smartcard (4) is registered with the aid of a separate transacting device (6) associated and communicating with each smartcard as its own pair, in which information about funds or information transfers via the smartcard (4) is stored.

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Method for handling cash or other confidential information electronically

5 This invention concerns a method for handling cash or other confidential information electronically, where the information is transferred electronically through a smart-card or a similar device with programmable memory.

The current payment methods that correspond to cash are coins and notes, checks, bank bills and other documents
10 entitling to payment. In many countries, also bank and postal cheque services and bank and credit cards are known.

Also well known are value cards (prepaid cards) for automatic charging devices.

15 The most advanced and flexible payment means would be cards containing cash in electronic form, ie. smart-cards (ic cards). The technology for such cards already exists, but so far a money purse system that could be classified as a general payment system is not yet used in any country.

20 The following drawbacks and usage bars have ac. been seen to be connected with electronic purse systems:

- smartcard payment operations with current methods are possible only with devices supplied by the organization providing the service, eg. with payment terminals.
- 25 - insufficient security solutions. If the smartcard is lost or stolen, the owner loses the cash loaded into it as well.
- narrow infrastructure - places to make payments are too few, and payment between individuals is not possible.
- lack of information for the payer - the amount of cash
30 loaded should be as easy to check as checking cash in the purse.

The purpose of this invention is to achieve a decisive improvement over the drawbacks set forth above. To achieve this effect, the method of the invention is characterized by that the transfer of funds or information to or
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from the smartcard is registered with the aid of a separate transacting device associated and communicating with each smartcard as its own pair, in which information about funds or information transfers via the smartcard is stored.

5 The system according to the present invention for handling cash or other information to be protected electronically, based on an electronically programmable smartcard or equivalent, is characterized by that the system consists of the smartcard and of a transacting device operating as
10 its own pair, into which the smartcard is insertable in order to effect electronic transfer of funds or information between the smartcard and the transacting device.

 One preferred embodiment of the system according to the invention is characterized by that the smartcard and
15 the transacting device associated with it have an essentially similar logic, so that the logic part of the transacting device consists essentially of a duplicate of the smartcard.

 The most important benefit of the invention is a
20 more secure and more easy-to-use payment method than cash both for the payers and for the receivers of payment. As an advantage of the invention can also be held the presumption of fast acceptance, since it does not require retailing shops to change their cashier systems.

25 The invention is described below in more detail with the aid of examples by reference to the attached drawings, in which

 figure 1 shows the smartcard reader device used in the invention in actual size,

30 figure 2 shows the basic parts of the system according to the invention seen from above,

 figure 3 shows the parts of figure 2 as seen from a side view,

35 figure 4 shows schematically the registers of the smartcard.

The invention thus concerns such an electronic payment method and system, where a card or equivalent provided with its own logic is used. Generally, these cards has been called intelligent cards or transaction cards. Further denominations in English are Smart Card, IC Card and Chip Card. The card can be used as a cash payment means, because it contains up-to-date information about the owner's cash funds, which can be maintained in a payment transaction situation. Usually, this kind of payment and cash transaction service is supplied by an organization which is in close cooperation with banks and possibly with credit card companies, using their distribution network.

Cash can be loaded and unloaded at automatic teller machines (ATMs) which are equipped with smartcard readers and which are programmed with the functions required for handling electronic funds. Also the working stations and data transfer services can be provided with programs to support transfer of electronic funds. A connection to the account system of the bank can also be accomplished with the aid of the so called telebanking exchange connections.

A prerequisite for using a smartcard in an ATM is that the card owner has a bank account and -card activated for usage with ATM. The bank card information and the personal identification number (PIN) are stored in connection with the delivery of the card on the safety area of the smartcard. Of course, the smartcard can act itself as a bank card.

The electronic cash handling system according to the invention thus consists in addition to the smartcard 4 of a transacting device 6 operating as its own pair, into which, as is shown in figures 2 and 3, the smartcard is insertable in order to effect electronic transfer of funds.

The transacting device 6 contains a display 1, a numeric keyboard 2 and a function keyboard 3 of the transacting device. Additionally, the transacting device has a

changeable battery and a clock and calendar, which are needed for the maintenance functions. With the calculator-like transacting device it is thus possible to read the smartcard, to give commands to the smartcard in order to make and receive payments, and to perform other functions as well, such as calculator and calendar operations.

According to figures 2 and 3, the logic of the transacting device 6 consists essentially of a duplicate 5 of the smartcard 4, whereby a complete copy of the data in the smartcard can be easily stored in the logic of the transacting device. The transacting device 6 and the smartcard 4 operates as a pair in order to make payment possible only when both are in use. This feature has the consequence, that when one part of the pair is lost, the service supplier can transfer the funds from the part left back to the client's account, and invalidate the half without a pair. For this reason, the card 4 is not kept continuously in the transacting device 6, but separately for instance in a wallet, like a regular bank or credit card.

The smartcard 4 is the actual operational card, with the aid of which the communication with the service supplier's network can be handled, upon loading or unloading funds and when making payments to other transaction devices. The smartcard 5 is situated inside the transacting device in a fixed fashion. The smartcards 4 and 5 communicate with each other through readers 4a and 5a. The information exchange between the cards is crypted. External communications may be performed also with the aid of the transacting device's serial port 7.

The figure 4 is a schematic presentation of the registers in the smartcards 4 and 5, which are used in funds transfers. In the following, a description of different payment and transfer actions is given with reference to this figure and, if necessary, to figures 1-3.

Withdrawing cash from an ATM

The client inputs his smartcard into the ATM and the pin-number (Personal Identification Number) associated with it. The ATM reads in a known way the bank card information stored in the safety area of the smartcard's 4 (figure 4) register 9a, and performs the withdrawal operation as when processing cash withdrawal. Instead of giving notes, the ATM transfers the amount to the smartcard's 4 "activated funds transfer" field 10a situated in the safety area. The ATM performs a funds transfer, which debits the customer's account and credits the service supplier's electronic money transfer account (bound account). When the smartcard is thereafter inserted in the transacting device 6, the smartcard 5 first checks that the smartcard 4 is its own pair by comparing the PIN and other identification data stored in the registers 9a and 9b. The balance information in the registers 11a and 11b are also compared. Then the smartcard 5 reads the field 10a and notices that there is an activated cash amount. The amount data is copied to field 10b in card 5. After this, the amounts in the fields 10a and 10b are added to the balance fields 11a and 11b, and it is checked that the balance of both cards are equal. If they are, the transfer is accepted and the balance and possible transaction logs are updated and the fields 10a, 10b are cleared.

Transaction log

The smartcard 4 and the account associated with it can thus be in any bank that is connected to the ATM network. A "normal" transaction is entered to the ATM network. For the accountkeeping account it makes no difference whether the notes have been withdrawn or funds have been loaded to the card. The accountkeeping bank handles the inter-bank clearing etc. like cash had been withdrawn.

A smartcard customer can choose to have a transaction log function associated to his cash handling system. The function is similar to a passbook, ie. all transactions

are logged. Logged information include for instance time, explanation text and the amount. The log can be continuous showing for instance the 50 latest transactions, or it can be transferred to other systems for uploading. It is also possible to have the transaction log printed out by the printer in the ATM.

Payment

The smartcard 4 is inserted in the card terminal of the transacting device 6 and the amount of the payment is keyed in. For the payment order, the pin number of the smartcard must be entered. After this, the payment is activated in field 10a of card 4, which means that the balances both in the smartcard 4 and the transaction device 6 have been reduced, and that the amount now can be transferred to the transaction device of the receiver. The transaction can also take place via a data transmission link by connecting the transacting device via its serial port 7 to a computer provided with data transmission software.

Receiving payment

The smartcard 4, having been activated with the amount to be transferred, is given to the receiver of the payment, which inserts the smartcard 4 into his own transacting device 6. The payment's receiver can now with a simple command transfer the amount to his own transacting device. In addition to the amount, the name of the receiver is transferred to the card of the payer, and the name of the payer is transferred to the transacting device of the receiver. This information is used for maintaining the transaction log, if the user has defined such in his transaction device.

Cancelling payment

If the payment is to be cancelled before the transfer to the receiver has taken place, the activated amount can be pulled back by inserting the smartcard 4 into its own

transacting device 6 and acting like receiving a payment from a foreign card. If the amount already was transferred to the receiver's device, the procedure of the reversal is the one of normal payment.

5 Transfer from card to own account

Funds can be transferred from the smartcard 4 to ones own account by entering the amount to be transferred in the transaction device 6 and by issuing a transfer command. The function is similar to the payment routine. When the amount
10 to be transferred has been activated, the card is inserted to an ATM, and the function "transfer to account" is chosen. The ATM makes an account transfer operation in the bank's payment exchange system, in which the electronic funds transfer account is debited and the bank account
15 whose number is defined on the smartcard's safety area is credited. Alternatively, the serial port can be used. An uploading to a bank account can be made by data transfer as well.

National balancing clearing

20 The benefit of the service supplier and the banks in funds transfer happening via smartcards is that the transactions of the smartcard customers will be forwarded through exchange accounts of the service supplier's banks, to which, on average, the capital available to the bank is accumulated (float). Balancing clearing means clearing the service
25 supplier's accounts daily in various banks in the same country. A balancing clearing program in the bank's central computer writes daily a payment order (check) from the service supplier's account in each payer's bank, which is refunded to the service supplier's account in the redemption
30 bank (the bookkeeping bank) and cleared normally in accordance with the practice of each country and bank.

Payment with foreign currency

35 In order to pay with foreign currency, the payer must withdraw currency of the country in question to his smartcard/-

device from an ATM located abroad. Withdrawal is possible only in those banks and ATMs, where withdrawal of cash with the payer's bank card is possible. In this way the withdrawal is routed to the payer's account like making currency cash withdrawals. In order to avoid the national balancing clearing in connection to withdrawal of foreign currencies, the service supplier's account is credited only in one bank in the country in question. From this account, all currency based payments in the country are redeemed. With the exemption of the currency conversion, the principles of operation are the same as when loading one's domestic currency.

Security

The question of security is the foundation-stone of all the operations of the transacting device. The issue is just as important as that notes should be difficult to falsify. The security of the transacting device is based on both physical and logical protection qualities of the smartcards on one hand and the fact that the service supplier has the possibility of controlling the state of the smartcards in the network with automatic (and secret) checks the other hand.

All message transferring between the different units is crypted with private algorithms, which are controlled only by the service supplier.

The system mentioned above can be used for instance in access control or in the storage and forwarding of personal data (medical- and authority files). For example, the checking of a person's identity and access authorization within an access control system is easy with the aid of transaction devices carried by the guards.

It is clear for one skilled in the art that the different embodiments of the invention are not limited to the examples presented above, but they can vary within the claims enclosed herewith.

Claims

1. A method for handling cash or other confidential information electronically, where the information is transferred electronically through a smartcard (4) or a similar device with programmable memory, characterized by that the transfer of funds or information to or from the smartcard (4) is registered with the aid of a separate transacting device (6) associated and communicating with each smartcard as its own pair, in which information about funds or information transfers via the smartcard (4) is stored.

2. A method according to claim 1, characterized by that in order to effect a payment transaction, the smartcard (4) is inserted into the transacting device (6); the loading field (10a) of the smartcard's (4) memory is activated with the aid of the transacting device in order to hand over a cash amount, the smartcard is removed from the transacting device and inserted in an ATM or a corresponding system or into a transacting device (6) associated with another smartcard, and the account transfer is performed with the aid of the transacting device into which the smartcard (4) is inserted.

3. A method according to claim 1 or 2, characterized by that in a collection operation, the smartcard (4) is inserted into an automatic teller machine or a corresponding system or into a transacting device (6) associated with another smartcard, and the cash amount is hand over to the loading field (10a) of the smartcard's memory.

4. A method according to claim 2 or 3, characterized by that the smartcard (4) after each transfer operation is pushed into its own transaction device (6) for an update of balance data and for clearing of the loading field (10a).

5. A system for handling cash or other information to be protected electronically, which is based on an electronically programmable smartcard (4) or equivalent, characterized by that the system consists of the smartcard (4) and of a transacting device (6) operating as its own pair, into which the smartcard is insertable in order to effect electronic transfer of funds or information between the smartcard (4) and the transacting device (6).

6. A system according to claim 5, characterized by that the smartcard (4) and the transacting device (6) associated with it have an essentially similar logic, in order to facilitate storage of a copy of the data of card (4) to the transacting device (6).

7. A system according to claim 6, characterized by that the logic part of the transacting device (6) consists essentially of a duplicate (5) of the smartcard (4).

1/1

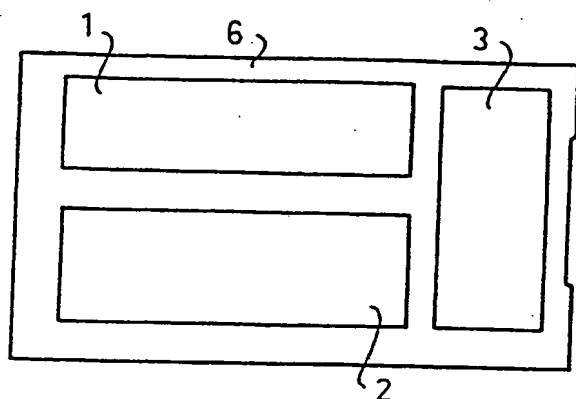


FIG. 1

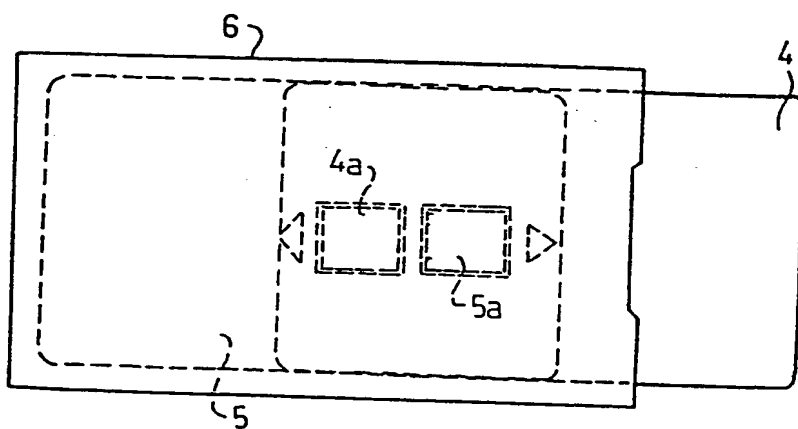


FIG. 2

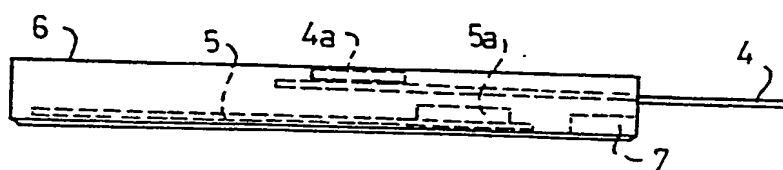


FIG. 3

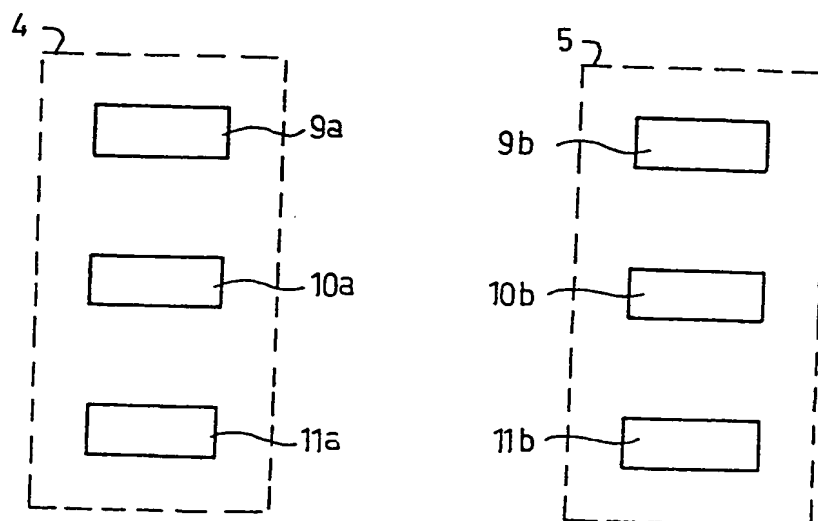


FIG. 4

INTERNATIONAL SEARCH REPORT

International Application No PCT/FI 91/00052

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC5: G 07 F 7/08		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
IPC5	G 06 K, G 07 F	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched ⁸		
SE,DK,FI,NO classes as above		
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category [*]	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	US, A, 4277837 (P. E. STUCKERT) 7 July 1981, see the whole document --	1-7
X	US, A, 4837422 (J. DETHLOFF ET AL) 6 June 1989, see the whole document --	1-7
X	US, A, 4719338 (J.M. AVERY ET AL) 12 January 1988, see the whole document --	1-7
A	US, A, 4454414 (W.M. BENTON) 12 June 1984, see abstract; figures 1-12 --	1-7
<p>[*] Special categories of cited documents: ¹⁰</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
29th May 1991	1991 - 05 - 31	
International Searching Authority	Signature of Authorized Officer	
SWEDISH PATENT OFFICE	Lars Jakobsson	

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	EP, A2, 0172670 (TECHNION RESEARCH & DEVELOPMENT FOUNDATION) 26 February 1986, see abstract; figure 1 --- -----	1-7

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.PCT/FI 91/00052**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the Swedish Patent Office EDP file on **91-04-30**.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		DE-A-C- 2852941	79-07-05
		FR-A-B- 2413721	79-07-27
		GB-A-B- 2011671	79-07-11
		JP-C- 1220759	84-07-26
		JP-A- 54094855	79-07-26
		JP-B- 58053784	83-12-01
		NL-A- 7812390	79-07-03
		SE-A- 7812924	79-07-01
US-A- 4837422	89-06-06	EP-A- 0306892	89-03-15
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US-A- 4719338	88-01-12	NONE	
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